## AMENDMENTS TO THE CLAIMS

1. (Currently amended) A method of controlling flow of liquids in a micro channel structure comprising the steps of:

providing a micro channel and a chamber in the microformat, said micro channel structure defining a liquid transportation system that is present on a plate comprising one or more of said liquid transportation systems, wherein the distance between two opposite walls in a channel is about ≤ 1000μm to about ≤ 1μm and the depth of a chamber is about ≤ 1000μm to about ≤ 1μm;~~, comprising the steps of:~~

providing in at least one position in said microchannel structure a plug of polymer material which comprises an intelligent polymer having the property of responding to externally applied energy by changing its volume, said polymer material in a first state providing a first volume blocking said channel from liquid flow, and in a second state providing a second volume giving pathway for liquid flow; and

selectively applying energy of appropriate type and magnitude to the polymer material of a selected one of said at least one plug so as to cause the volume change between said two states, thereby bringing said polymer to a desired one of said first or second states.

2. (Previously Presented) The method of claim 1, wherein said intelligent polymer is selected from the group of polymers consisting of heat responsive polymers, light responsive polymers, magnetically responsive polymers, pH responsive polymers and polymers responsive to electric fields.

3. (Previously Presented) The method of claim 1, wherein said polymer material is at least partially anchored to a surface inside said micro channel.

4. (Previously Presented) The method of claim 1, wherein the polymer material is chemically bonded to an inner surface in said micro channel structure.

5. (Previously Presented) The method of claim 1, wherein the polymer material is anchored in the micro channel structure by means of a mechanical obstruction in the micro channel structure.

6. (Previously Presented) The method of claim 1, wherein the material in the inner surface of said micro channel structure comprises material selected from the group consisting of plastics, rubbers, metals, carbon, inorganic oxides, nitrides, carbides, silicon, and quartz.

7. (Previously Presented) The method of claim 6, wherein said material in said micro channel surface is subjected to a surface treatment selected from the group consisting of wet etching, plasma treatment, corona treatment, UV treatment, grafting, and adsorption coating.

8. (Previously Presented) The method of claim 1, wherein the step of applying energy comprises heating the polymer material, wherein the polymer material comprises a heat responsive polymer.

9. (Previously Presented) The method of claim 8, wherein said heating is performed by irradiating with electromagnetic radiation.

10. (Previously Presented) The method of claim 1, wherein the step of applying energy comprises illuminating the polymer material with light of a suitable wave length, wherein the polymer material comprises a light responsive polymer.

11. (Previously Presented) The method of claim 1, wherein the step of applying energy comprises exposing the polymer material to a magnetic field, wherein the polymer material comprises a magnetic responsive polymer.

12. (Previously Presented) The method of claim 1, wherein the step of applying energy comprises exposing the polymer material to an electric field, wherein the polymer material comprises a polymer responsive to electricity.

13. (Previously Presented) A micro channel valve system comprising a plug of a polymer material, wherein said polymer material comprises an intelligent polymer having the property of responding to externally applied energy by changing its volume, said plug being present at a selected location within a micro channel structure comprising a channel and a chamber in the microformat, said micro channel structure defining a liquid transportation system that is present on a plate comprising one or more of said liquid transportation systems,

wherein the distance between two opposite walls in a channel is about ≤ 1000μm to about ≤ 1μm and the depth of a chamber is about ≤ 1000μm to about ≤ 1μm.

14. (Previously Presented) The valve system of claim 13, wherein said intelligent polymer is selected from the group of polymers consisting of heat responsive polymers, light responsive polymers, magnetically responsive polymers, polymers responsive to electric fields and pH-responsive polymers.

15. (Previously Presented) The valve system of claim 13, wherein said polymer material comprising said intelligent polymer is selected from the group of polymers consisting of polyvinylethers, polyacrylamides, polyvinylamides, polyalkyleneglycols, celluloseethers, polyacylates, polymethacrylates, N,N-diethylacrylamide, N,N-diethylbisacrylamide, and N-vinylcaprolactam.

16. (Previously Presented) The valve system of claim 13, wherein said polymer material is anchored inside said channel by chemical bonding.

17. (Previously Presented) The valve system of claim 13, wherein said polymer plug is anchored only over a fraction of the contact surface between the plug in a swelled state and the inner surface of said micro channel structure.

18. (Previously Presented) The valve system of claim 13, wherein said polymer plug is retained in a fixed position inside said micro channel structure by mechanical means.

19. (Previously Presented) A chemical reactor comprising a plurality of micro chambers interconnected by micro channels that are part of a liquid transportation system, having a valve system of claim 13, provided in at least one of said micro channels.

20. (Previously Presented) The chemical reactor of claim 19, wherein said chambers and micro channels are provided in a planar substrate.

21. (Previously Presented) The chemical reactor of claim 20, wherein the substrate is a material selected from the group consisting of plastics, rubbers, metals, carbon, inorganic oxides, nitrides, carbides, silicon, and quartz.

22. (Previously Presented) The chemical reactor of claim 20, wherein the substrate is circular.

23. (Previously Presented) The chemical reactor of claim 20, wherein the substrate is rectangular.

24. (Previously Presented) The method of claim 1 wherein said at least one position in said micro channel structure is a plurality of positions.

25. (Previously Presented) The method of claim 6, wherein said plastics are selected from the group consisting of polycarbonates, polystyrenes and cycloolefin polymers.

26. (Canceled)

27. (Previously Presented) The valve system of claim 13, wherein said intelligent polymer material is a polymerization product of N-isopropylacrylamide and N,N-methylene bisacrylamide.

28. (Previously Presented) The chemical reactor of claim 21, wherein said plastics are selected from the group consisting of polycarbonates, polystyrenes and cycloolefin polymers.

29. (Canceled)

30. (Previously Presented) The valve system of claim 13, wherein said chamber and said micro channel are defined between two planar surfaces applied to each other.

31. (Previously Presented) The method of claim 1, wherein said micro channel and said chamber are defined between two planar surfaces applied to each other.